

## A Gimbal-Stabilized Compact Hyperspectral Imaging System, Phase I



Completed Technology Project (2007 - 2007)

## Project Introduction

The Gimbal-stabilized Compact Hyperspectral Imaging System (GCHIS) fully integrates multi-sensor spectral imaging, stereovision, GPS and inertial measurement, gimbal-stabilization, and gimbal-pointing-and-tracking capabilities into a compact light weight package. Advanced adaptive Kalman filter and attitude calibration algorithms are embedded for precision inertial measurement and real-time platform stabilization/pointing control. Innovative multi-thread-coded, fully parallel execution software is implemented with the latest multi-core CPU, which makes operation of GCHIS seamless. GCHIS concurrently acquires pushbroom hyperspectral imagery and multispectral snapshot stereo pairs. It features: 1) at least a 1392 pixel swathwidth and 5nm spectral resolution in the VNIR range for hyperspectral imaging; 2) at least 1600 x 1200 frame size for four band multispectral imaging; 3) 12 bit digitization depth for all imaging components; 4) less than 20lbs complete instrument mass; and 5) 1/100 degree platform stabilization/pointing accuracy. GCHIS has a fast data rate for high resolution and large area coverage. GCHIS can deliver one-foot resolution orthorectified hyperspectral imagery and inch level resolution multispectral stereo imagery. With gimbale stabilization and programmable pointing, GCHIS is highly resistant to air turbulence and can handle diverse flight profiles, e.g. non-linear corridors and block areas, high and low altitudes, re-visiting or repeated measurement for change detection, and etc.

## Anticipated Benefits

GCHIS offers a fully integrated compact spectral imaging and stereovision system, which can be fitted into diverse light aircraft, small UAVs, and airships to provide low-cost and high performance commercial remote sensing solutions. Its competitive advantages include its foot resolution hyperspectral and inch resolution stereovision capabilities. As a programmable gimbale instrument, it is also capable of performing most challenging remote sensing missions. That include: 1) homeland and national and international border security, 2) disaster and emergency response for recovery and rescue, 3) law enforcement, and 4) IED detection. As an extremely cost-effective remote sensing tool, GCHIS has a great potential for other general remote sensing applications, including precision agriculture; crop growth status monitoring; vegetation species mapping; rainforest, forest and park services; environmental application; surface pollution detection; land-use surveys; water color, quality, waste discharge, and etc.



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## Organizational Responsibility

### Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

### Lead Center / Facility:

Goddard Space Flight Center (GSFC)

### Responsible Program:

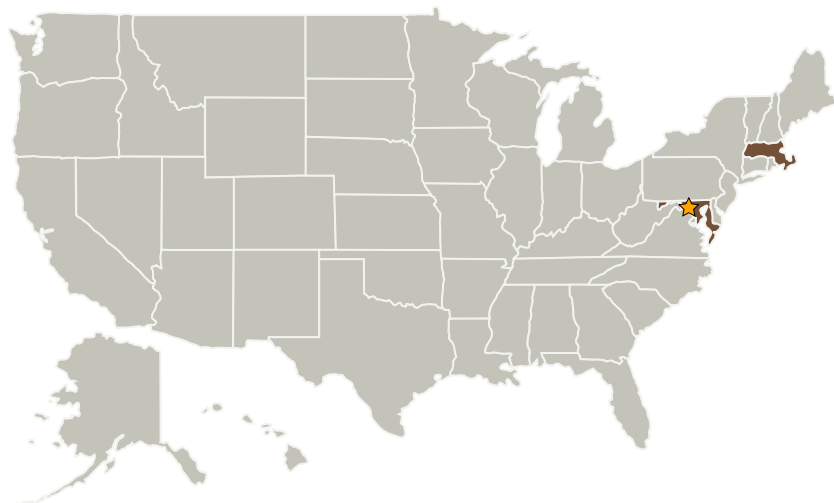
Small Business Innovation Research/Small Business Tech Transfer

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## Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
★Goddard Space Flight Center(GSFC)	Lead Organization	NASA Center	Greenbelt, Maryland
Flight Landata, Inc.	Supporting Organization	Industry	North Andover, Massachusetts

## Primary U.S. Work Locations

Maryland	Massachusetts
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## Project Management

**Program Director:**

Jason L Kessler

**Program Manager:**

Carlos Torrez

**Project Manager:**

Peter K Shu

**Principal Investigator:**

Xiuhong Sun

## Technology Areas

**Primary:**

- TX08 Sensors and Instruments
  - └ TX08.1 Remote Sensing Instruments/Sensors
  - └ TX08.1.5 Lasers